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TECHNICAL INSTRUCTION

IN

ELEMENTARY AND INTERMEDIATE SCHOOLS.

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BY

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Director and Secretary of the City and Guilds of London Institute for the Advancement of Technical Education.

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One of the many points that strike the observer in comparing foreign schemes of education with our own, is the more systematic gradation of schools abroad, showing the several stages through which a youth passes on his way from the primary school to the university, or corresponding technical institution. In England, owing mainly to the large number of private schools—whose aims and objects are not, in all cases, well defined—and also to the influence of class distinctions, our schools overlap one another to a very great extent, and it is difficult to classify them according to any simple educational principle. As our technical schools are new, and are likely to become every day, to a greater extent, the schools of the people, it is desirable that they should be so organised as to constitute a compact hierarchy, forming a graduated series from the lowest to the highest; and there would be a certain advantage and simplicity if they could be known and designated as schools of the 2nd, 3rd, or 4th grade, beginning with the primary schools as the lowest.

The City and Guilds of London Institute for the Advancement of Technical Education has had in view the completion of such a series, in the schools which have been established under its direction; and recognising the well-known fact that the higher grades of education stand more in need of adequate endowment than the lower, the Institute has directed its efforts, in the first place, towards the establishment of schools of the 3rd and 4th grades, represented, in its scheme, by the Finsbury College, which has recently been opened, and by the Central Institution, now in course of erection. In this graduated series, one important school, or class of schools, is still wanting; and the consideration of this want, and how to supply it, will form the main subject of the present paper.

In describing the seven ages of man, our great poet gave one only to school life—

> " At first, the infant,
> Mewling and puking in the nurse's arms;
> Then the whining schoolboy, with his satchel
> And shining morning face, creeping like snail
> Unwillingly to school."

Judging from these lines, I think we may conclude that Shakespeare had probably no conception of infant education, and that he had little experience of the value of educational method in making a child's school-days pleasurable instead of painful. But a closer analysis of the period of school-life shows that it really consists of five stages, represented by the infant school, or Kindergarten, and the elementary school, both of which may be said to be common to the education of all children; and then on the technical side, by the intermediate technical school, the technical college or professional school, and the technical university. The necessity for the addition of this technical side to our educational system is due mainly to the rapid growth of our manufacturing and engineering trades, which have opened up occupations and careers that did not exist a century ago. The old grammar school education has been found to be no longer the best training for persons who are to be engaged in these different occupations. Every day it is becoming more generally recognised that education must have some reference to the career or future work of the person educated, and that schools are needed which shall be as well adapted to the present requirements of productive industry, as were the grammar schools of old to the several kinds of professional life, in which alone educated persons were then engaged. In former times, the few people who received more than an elementary education, were instructed in those special subjects which would prove serviceable to them in the pursuit of their special callings. The priest studied Hebrew and Greek; the lawyer, Latin and logic; the statesman, history and rhetoric; and the rest of mankind who received any school education whatever, were content with the power of reading, writing, and reckoning. Those who were employed in any kind of skilled labour learned their trade from the masters to whom they were apprenticed. Instruction of this kind had a direct bearing upon the career of the person who received it; and, to this extent, the education of all these classes of persons might be called technical; although it is customary, in this country, to restrict the meaning of that word to education bearing directly upon productive industries. Granting that all education should have for its object the preparation of a man for the real work of life, what we have now to consider is the kind of education which shall best fit the children of the labouring and lower middle classes of the population for the several occupations in which they will be engaged, and which shall, at the same time, afford facilities for the selection of the brightest and most capable of such children for higher training.

I. The problem of primary education is somewhat simplified in this country, owing to the fact that the public elementary schools are attended almost exclusively by persons who cannot afford to pay the full cost of their children's tuition. These schools are, therefore, essentially the schools of our working classes, the schools in which labourers, artisans, and persons occupying humble positions in commerce and trade receive their first, and, in most cases, their only training. Although primary instruction is the basis of all education, and is necessarily very much the same, whether the pupils be the children of working men or of their employers, still there are differences in the methods of instructing children who will have to begin to earn their living at the age of twelve or thirteen, and of those who will continue their education until the age of sixteen or seventeen, or possibly later, which render it easier in this country than either in Germany or Switzerland, to adapt the instruction given in our primary schools to the specific wants of the class of pupils receiving it. Apart altogether from the question of social distinctions, which in Italy, America, and other countries does not prevent the son of the doorkeeper from receiving his instruction side by side with that of the master of the house, these educational considerations are likely to continue to induce well-to-do parents in this country to attach importance to the provision of separate elementary instruction for their children, either in the lower forms of secondary schools, or in preparatory schools leading up to them.

In this country we have not yet had time to realise the full benefit of the Education Act of 1870; but there is little doubt that this Act, amended as it has been by subsequent codes, has done much, if not everything, towards the solution of the problem of primary instruction for the masses. The most earnest advocates, however, of the last Revised Code would probably be willing to admit that there is no finality even in revised codes, and that additions and improvements are still possible.

On every occasion on which I have had the opportunity of speaking on this subject, I have called attention to the neglect of drawing in many of our public elementary schools, which is the more to be regretted, seeing that the majority of the children trained in these schools are destined to commence life in occupations in which the ability to draw is quite as useful to them as the ability to spell. I am inclined to think that it is partly in consequence of the examination and inspection of drawing being placed under a different department of State from that which superintends the general work of elementary schools, that this subject, important as it is, comes to be regarded as an extra rather than as an essential element in primary instruction. Adequately satisfactory results are not likely to be obtained until drawing shall have been made an obligatory subject, both in girls' schools and in boys' schools, subject to the same rules of examination and inspection as reading, writing, and arithemetic.

There is another subject of instruction, which, having regard to the future occupations of the pupils, ought, in the opinion of many educational authorities, to be introduced into public elementary schools, viz., instruction in the use of the more ordinary tools found in every workshop. The advocates of this proposal do not desire that lessons in handicraft work should occupy any part of the time that is now devoted to other subjects of instruction, neither do they suggest that such teaching should take the place of apprenticeship to any trade, nor do they expect even that it would sensibly diminish the period of such apprenticeship. They look to the disciplinary rather than to the directly useful influence of such teaching, and they recognise in it many distinct advantages. Following on the Kindergarten system of handicraft exercise, this instruction would help still further to train the hand to the perception of differences of size, form, roughness, and other qualities, which the sense of touch, guided by the muscular sense and sight, enable us to appreciate; and in this way it would serve as a real discipline and as a sense exercise. Morally, it would teach children, at an early age, that there is nothing derogatory in hand-work. On the contrary, by making workshop teaching a part of the school instruction, the pupil would be trained to recognise the dignity of labour, and would come to understand that it is as honourable to earn one's living by the use of the file as of the pen. M. Jules Ferry, in lay the foundation-stone of a Professional school at Vierzon, one day this month, is reported to have said :—

> " Caste ideas would vanish when tools were found in schools alongside of maps and books, the nobleness of manual labour would be perceived, and concord would be spread."

Whether the effect of the introduction of workshops into schools would be to " root out anarchist passions," as M. Ferry is further reported to have stated, I am unable to say, but certainly it would tend to draft into manufacturing industries a number of youths who, at present, seek employment in commercial or badly-paid literary work, and who can be much better spared from the office-desk than from the workshop bench. In the schools of our manufacturing cities it is, perhaps, more important that this kind of manual exercise should find a place than in those of the great centres of commerce. Although it is quite true that, in these towns, the majority of the pupils from the elementary schools will be engaged in handicraft work during the whole, or the greater part of, their life, and that, therefore, it is well to employ such time as they can give to education in purely intellectual pursuits, there are compensatory advantages in training the child's hand and eye at an early age which should not be lost sight of. For apart from the social considerations to which I have referred, the nimbleness of finger thus acquired is likely to save the boy, on entering the factory or mill, where he is at once told off to some work requiring quickness of manipulation, from much of the weariness and drudgery of the first few months of his apprenticeship, and to make him permanently a better workman.

In considering the question of the introduction of handicraft work into our public elementary schools, we always have the example of the French schools to fall back upon. As nearly everybody now knows, the experiment has been tried for some years in the Communal School of the Rue Tournefort, Paris. When this school was first established, the boys commenced handicraft work at the age of ten; but since the beginning of the year 1881, children of six years of age have received instruction during three hours a-week in the use of tools. In the highest class of this school, the pupils, besides receiving instruction in drawing, chemistry, and in science, work eighteen hours a-week in the shops. During the last year, the work of the pupil is specialised in certain directions, so that the school partakes of the character of a trade school. The hours are from eight in the morning till six in the evening, with a half-holiday on Thursday. It has been thought that the amount of time devoted in this school to workshop instruction interferes with the purely literary education of the pupils, and, consequently, this school has not been made the type of others that have recently been established in Paris and elsewhere. In accordance with the Laws of December, 1880, and of July, 1881, handicraft work has now been introduced (as an optional subject) into most of the communal schools of Paris. Both Chambers of the French Assembly are agreed that primary instruction should include manual work, and the use of the tools of particular trades.

When the Commissioners on Technical Instruction visited Paris in 1881, there were twenty-three primary schools to which workshops had been attached, ten others were on the point of being opened, and preparations were being made to attach workshops to twelve more. Since then I have ascertained that forty-one schools are fitted with workshops, and it is the intention of the authorities to attach them to all the communal schools of Paris. The manual instruction in these schools begins only at the age of ten years.

Brussels has followed the example of Paris. In the primary State schools recently erected, and constructed very much on the pattern of the Ecole Modèle, now converted into a training and practising school, workshops have also been introduced. In a mixed school I visited, some few months since, situated in the Rue du Canal, the girls were instructed in various kinds of needlework, whilst the boys of the upper classes learned modelling, drawing, carpentry, turning, and smiths' work, devoting about four hours a week to workshop instruction. The school provides for over 1,000 pupils; about forty of whom were engaged in practical work at the date of our visit. The workshops were very small, or the numbers would probably have been larger, but all the boys pass through the shops before leaving the school. Judging from the character of the general literary instruction which we had the opportunity of inspecting, I should say that the time devoted to this work had not in any way interfered with the teaching of the ordinary school subjects. Neither in Germany, in Switzerland, nor in Italy, is workshop instruction given in the elementary schools; but in these three countries the public elementary schools are by no means as exclusively frequented by the children of the working classes as they are in England, France, and Belgium. Whilst generally in favour of the introduction of some kind of handicraft work into our elementary schools, I think it very desirable that the instruction should not be commenced at too early an age. To children below the Fourth Standard, I do not believe it would be of any practical use. It is important, moreover, that the main object of such instruction should be kept steadily in view, viz., the discipline and exercise of hand and eye, without reference to the requirements of any particular trade. There can be little doubt that so much skill as a boy would acquire in handicraft work during the last year or two of his attendance at an elementary school, would be useful to him in any and every occupation in which he might be subsequently engaged. I dwell upon the fact that the instruction should be without reference to special industries; because, viewed in this light, I see no reason which should prevent the Government from including handicraft work among the list of specific subjects on which grants are made. Indeed, I can find no difference in principle between paying grants on needlework in girls' schools, and on handicraft work in boys' schools. It is possible that the girl may become a sempstress, and the boy a carpenter; in either of which cases, the instruction may be regarded as trade instruction. But the lessons need not be given with any special object, but merely as a part of the general education of the child. The case of manual work in boys' schools seems to me to be exactly parallel with, and in every way analogous to, that of needlework in girls' schools; and I am inclined to think that the value of the one kind of teaching should be as fully recognised and assisted by the State as that of the other.

II. As soon as we ascend one step higher on the educational ladder, the tendency to specialise instruction, with the view to the future occupation of the pupil, commences. The bifurcation or the "trifurcation" of studies, if we may use the word, takes place according to the social position of the parents, or according to the probable career of the pupil. This tendency to give a bias or direction to the studies of a child commences in the higher elementary and middle class, or preparatory, schools; *i.e.*, in the education of a boy between the ages of thirteen or sixteen. Speaking generally, and it is difficult to be definite or specific without going into very great detail, boys who are intended to pursue a university career, or to enter the legal, the clerical, or the scholastic professions, learn both Latin and Greek; those entering a profession, such as medicine, in which some acquaintance with science is necessary, learn Latin, but no Greek; and those who expect to become mechanical engineers, foremen of industrial works, superior artisans—the majority of whom go to work with the knowledge and aptitudes they take away with them from schools of a grade higher than the elementary—should have the opportunity of omitting from their instruction both Latin and

Greek, and of giving their attention to practical science and modern languages. It is this last class of intermediate schools which is at present wanting in our educational system. Of preparatory schools adapted to the wants of rich men's sons, who will carry on their education in our great public schools, there is no lack. Those who frequent them can afford to pay for the instruction they require, and their wants are well supplied. Of middle schools, leading to our new first grade modern schools, or to the modern side of our classical schools, there is also no great need. Nearly all the new grammar schools, whose schemes of instruction have been drawn up by the Endowed Schools Commissioners, fall within this category; and with the view to remedy any deficiency in the number of such schools, in towns where no endowment exists which can be utilised for this purpose, a public company has recently been started, which I hope may meet with all success, to supply additional schools of this type. But of schools adapted to the requirements of children of the artisan classes—schools into which the picked pupils from the elementary schools might be admitted, and where they would receive an education which would train them as intelligent workmen or clerks—there exist at present only a few isolated examples; and considering that the classes of persons for whose benefit they are needed are not able to pay for them, nor likely to agitate for their establishment, the want which is so seriously felt, impeding, as it does, the progress and due development of technical education in this country, will probably remain, unless the State, or the municipalities, or wealthy individuals, interested in the progress of education, voluntarily aid in their foundation.

In Ireland, where new industries have to be created, the want of technical instruction in the primary and intermediate schools is more keenly felt than in England or Scotland; and it is possible, if technical instruction is to be introduced into Irish schools, that it may have to be more specialised than would be necessary or desirable in this country. This subject in all its bearings is now receiving the careful consideration of the Commissioners, and although it is impossible to forecast the measure of the success they may achieve, I think I may say that they are fully aware of the pressing importance of the question, and will spare neither time nor thought in endeavouring to arrive at some satisfactory conclusions.

It may be interesting, however, here to mention that a committee appointed by the Municipal Council of Dublin, to consider the question of technical education in Ireland, have issued a report, in which they state —

> "We conceive that education in Ireland is on too exclusive a literary basis. We believe that, from the earliest years, the training of the hand, the eye, and the mind, whether by the Kinder-garten system or otherwise, should be made a matter of primary importance. We think that all alike should be taught drawing, as the best preparation for almost any avocation. . . . In the principal towns throughout the country, schools should be more completely equipped for instruction in the industries suitable to the particular locality. . . . We consider that the advantages offered by examinations, under the London Guild Schools' scheme, should be immediately availed of by committees of manufacturers, without prejudice to the ultimate establishment of a similar scheme for Ireland on an independent basis."

A correspondent, too, who takes great interest in this matter, writes to me from Dublin, saying--

> "I venture again to beg of you to endeavour to call attention to the general absence, in all classes, of training other than literary. Drawing is universally neglected; mathematics and arithmetic do not receive the attention they should."

Without entering further into this question of Irish education, I pass to the consideration of the problem that has been engaging of late the attention of the School Board of London, and of other cities, viz., the establishment of so-called higher elementary schools. In London and elsewhere, there exist a number of middle-class schools, which are intended to give a complete education to children belonging to the lower middle-class, and which, as regards their educational rank, are intermediate between the secondary and the elementary schools. As preparatory to the modern side of our great public schools, these establishments may serve a useful purpose; but as offering a complete and useful training to the children of the better class of artisans, foremen, and small shopkeepers, who have to earn their living in manufacturing or commercial pursuits, they fail of their object. Their curriculum is a compromise, resulting from the conflict of too many studies. They break down between their aspirations and their necessities. Whilst endeavouring, to some extent, to adapt the instruction to the wants of the pupils, they cling with obstinate fondness to the traditions of the past, and, consequently, their curriculum is overcrowded, and nothing is well taught. It would seem that there is something of gentility, presumably attractive to the middle-classes, in the study of Greek, which induces the authorities to place this subject in the prospectus of these schools. For the time devoted to this study is far too short to enable a boy to derive any real benefit from it, unless it be the doubtful advantage of making him suppose that he understands the meaning and connotation of a scientific term when he has learnt its derivation. Latin is generally regarded as indispensable, not so much on account of its utility, for a boy seldom opens a Latin book after leaving school, nor for the mental discipline it affords, because that might be acquired through a modern language, or, indeed, through any other study, but in order that the pupils may pass the Oxford and Cambridge Local Examinations. It is true that there are a few boys in these schools who aspire to be surgeons, or to enter the medical profession, and for these an elementary knowledge of Latin may be necessary as a part of their professional training. Then, again, mathematics are frequently taught, as if the boy would spend his life in solving enigmas; and geometry is made a discipline in logic, the study of which leaves the pupil with a thorough distaste for the subject, and with no practical knowledge which he can apply to the simplest problems he will meet with in his ordinary work. In deference to public opinion, the boy is taught in many of these schools, but not in all, what is called science, and studies chemistry and physics from books, or by aid of lectures, accompanied by blackboard, or, in some cases, table illustrations, which pass for experiments. He learns a certain amount of French grammar, can translate a piece of simple French prose into English, but can neither speak, nor understand when spoken, two simple sentences. Of German he is generally absolutely ignorant. In many of these schools drawing is still taught from copies of landscapes, or elaborately shaded heads; and in scarcely any is there any approach to what may be called practical instruction. It may be thought that I am exaggerating the defects of the majority of our intermediate schools, but it is not so. For many years past, I have had opportunities of making myself acquainted with the education given in these schools, and the experience I have thus gained, confirmed as it has been recently by further experience, has led me to conclude that the curriculum of these schools must be greatly modified, if they are to give to the children of our middle classes a rational and serviceable education.

We often hear an outcry raised against the over-education of the so-called working classes. We are told that the higher instruction contemplated by the School Board is calculated to make children of the labouring class dissatisfied with their lot, and unfit for the work which they will be required to perform; that education takes the artisan out of his proper sphere, and leads him to plot or starve in another sphere which is already occupied by active workers. Some of us are apt to think lightly of this expression of fear, and to ascribe it to the alarm of despairing pessimists; but I am compelled to admit that, where the education is exclusively or to a great extent literary, there is some foundation for it. It cannot be denied that the higher education which the majority of our middle-class schools provide, tends to weaken the association of the artisan with his work, and to lift him out of his sphere, instead of enabling him, as it should do, better to understand and discharge his duties within it. If, however, the education of our intermediate schools were such as to develop the boy's faculties in a practical direction, to give him the knowledge and the skill that would be serviceable to him in productive industry—such knowledge as he would always desire to increase, and such skill as he would be always endeavouring to perfect, then the outcry against this over-education would be meaningless and needless.

It is to be regretted that, owing to the absence of good intermediate schools, in which the education provided might serve as a fit preparatory training for the subsequent work of the superior artisan, some of the best boys of the elementary schools of London have been taken out of the sphere in which their talents and skill are so much needed, and transferred to other occupations, and, possibly, to the overcrowded ranks of professional life. The few scholarships which the School Board of London possesses, are mainly employed in drafting the most promising pupils from these schools to the higher secondary schools leading to the Universities.

Mr. E. N. Buxton, in his opening address to the members of the School Board, on October 12th, 1882, referred to this disposition of the selected children from elementary schools. In remarking on the paucity of the scholarships at the disposal of the School Board of London, viz.:—103 in all, many of which are provided by the City Companies, he said:—

"It may interest the Board, as indicating the class from which these children are taken, to know that their parents follow respectively the occupation of school teacher, chemist, glazier, dressmaker, clerk, compositor, blacksmith, and decorator.

"The scholarships range in value from £16 10s. to £40 per annum, and enable the successful scholars, after leaving the elementary schools, to continue their education for some years longer in one of the higher schools, such as the City of London School, or the North London Collegiate School for Girls, whence, if they maintain their early promise, the door is open to them, by means of further scholarships and exhibitions, to the Universities . . . Some scholars have already passed with remarkable distinction through all these grades."

Now, see what follows from this absence of good intermediate schools into which these promising students might have been drafted, Schools like the City of London School, University College School, and King's College School, all of which have received pupils from the elementary schools, by means of these scholarships, do not, and are not intended to, provide the education which is specially adapted to the wants and requirements of our artisan classes. In the Universities, as at present constituted, the curriculum of studies, and the general associations, are not such as to render these ancient seats of learning the best training schools for the would-be engineer, the industrial chemist, the manager of a factory or mill. It has not been possible for me to trace the careers of the boys from the elementary schools who, during the last eight or nine years, have been thus educated; but it is more than probable that, owing to the absence of good intermediate schools, and of technical colleges, such as that now established in Finsbury, these boys have been trained to some professional or literary calling, by which productive and manufacturing industry has lost the acquisition of intellect it so much needs, and the lack of which has gone far to deprive us of our commercial supremacy. Mr. Buxton goes on to say, "It would be nothing less than national waste to restrain these children from the full exercise of their powers;" but I very much doubt whether the nation gains much by sending these children into the already overcrowded paths that are open to university students.

In considering the kind of instruction of which our artisan population stands in need, we must first of all cut ourself adrift from the traditions of the old grammar school system, and endeavour to establish some relation between the education of the child and the career in which he is likely to be engaged. We may take it for granted that, in the curriculum of these schools, there is neither room nor necessity for the study of Latin or Greek. The children of these schools must be educated, as were the Athenians of old, without the advantage of knowing any dead language. The vernacular proved sufficient, even as mental discipline, for the education of Phidias and Archimedes, and I see no reason why it should be found wanting in the training of their modern prototypes. The backbone of the instruction to be given in these schools should be mathematics. Of mathematics a boy cannot well know too much. It is applicable at all stages of his work, in the solution of the most elementary and of the highest practical problems, and without this necessary knowledge, the pupil's progress is continually impeded. But mathematics should be taught with a view to the possibility of their application; and for this reason, Euclid should be banished from the school, or confined to the instruction of the highest classes. The next subject of importance is science, and the branches of science most generally taught, viz., chemistry, mechanics, and physics, should be chiefly encouraged. The science teaching should be made the chief instrument for the exercise and development of the reasoning and observing faculties. It should be given more with this object than for the sake of the information imparted; and, consequently, the success of such teaching should be judged, not so much by the extent of the pupil's acquirements, as by the thoroughness of his insight into the principles and methods by which scientific laws have been established. It always seems to me that it is owing to the absence of the discipline of science teaching in our principal schools, that the experienced schoolmaster, feeling the necessity of some equivalent for stimulating observation, attention, comparison, and reasoning among his pupils, has been compelled to apply the methods of science to the teaching of classics, and has therefore attached less importance to the linguistic skill acquired by his scholars than to the mental discipline which the study has afforded. But although Latin or Greek may thus be made the instrument of scientific teaching, the study of these languages can never do the same for us as the study of any one branch of natural or physical science, because, as has been often said, science brings us face to face with real objects, things in themselves, and language tells us only about words. Mr. Matthew Arnold agrees with Wolf, and I think rightly so, in saying—

> "That all learning is scientific which is systematically laid out and followed up to its original sources, and that a genuine humanism is scientific."*

Scientific it is, but it is not science; and the argument of the humanists in education seems to me to be faulty in this, that they think that the teaching of scientific method in reasoning about words is an adequate substitute for the teaching of science in observing and reasoning about things.

It is superfluous to say that all intermediate schools should be provided with a laboratory, in which the pupils may receive practical instruction in chemistry. Too much importance, however, should not be attached to the students' ability to analyse a simple salt. Although qualitative analysis may be made the instrument of sound teaching, it may also degenerate into little more than a rule of thumb process—the mere carrying out of definite instructions. The value of this practical work depends upon the method of teaching adopted, upon the care with which the pupil is taught to observe, and the logical accuracy with which he is trained to reason upon the observations he has made. In physics and mechanics, the pupil should be exercised to a greater extent than is as yet common in practical work. The experiments to be performed by the pupil may be of the simplest and roughest kind, but they should have for their object the teaching of the methods of observation, which will be invaluable to the workmen, when thrown among the more complex phenomena of after life.

What I have said about drawing in elementary schools applies equally to intermediate schools. The pupils should have the opportunity of further pursuing their instruction in this subject, so that they may be able to discover any latent talent they may possess for art work, and so to determine for themselves their own careers. But in addition to drawing, modelling in clay should form a part of the art instruction of these schools. Modelling may be taught, and successfully taught, to very young children. It forms part of the curriculum of the Tournefort School, to which I have already referred. Abroad, the number of technical schools in which this subject is taught is very large. To nearly every art industry it is considered an indispensable preliminary training—to metal work of all kinds, pottery, wood-carving, &c. The educational value of this instruction is, no doubt, considerable. In many of the arts in which boys are likely to be engaged, facility in modelling, as showing the power of appreciating and realising solid forms, is found to be of the utmost service. Indeed, instruction in modelling constitutes a kind of supplement to that of drawing and may well be pursued at the same time by the young pupil training for art industries. In learning drawing, the pupil generally commences by copying from the flat to the flat, he then proceeds to copy from the solid to the flat, and lastly, he is engaged in rearranging materials previously studied, and in original design. In the teaching of modelling, the opposite course is followed; the pupil begins by imitating in relief what he sees in relief, and then proceeds to copy in relief what is presented to him in the flat; and lastly, by aid of mere sketches and suggestions, or original conceptions, to project into the solid form the pictures of his mind.

It is important that the humanistic elements of education should not be omitted from the curriculum of these schools. It is in the combination of literary with scientific and practical instruction that many foreign schools are so superior to our own. Language and literature may be regarded as indispensable requisites of all higher education. Indeed, I believe the educational value of knowing another language than our own is fully equal to the use it may be to us in enabling us to speak it or to write it. Words occupy in our minds a different meaning, and bear a different relation to the things for which they stand, when we know that the same thing may be expressed by more names than one. For this reason, and also on account of the undeniable and increasing utility, in commerce and in industrial pursuits generally, of a knowledge of modern languages, I would include both French and German in the course of instruction to be given in such schools. Of the importance of a good English education I have no time, nor is it indeed necessary, that I should now speak. I have no desire to enter here into the vexed questions, which rightly engage the attention of educationalists, as to the relative advantanges of different methods of teaching. Questions of detail of this kind are properly considered in societies exclusively devoted to the discussion of educational problems. We may take it for granted that these subjects should be taught in our new intermediate schools. But of the value of the study of literature in the future education of artisans, I venture to say one word, because I believe that, apart from the pleasure afforded to the pupil by the power to appreciate the writings of great men, and apart from the humanising and elevating influence which the love of good literature is calculated to exercise on the man's life, there is no subject which serves so well to stimulate and develop his imagination, to fill his mind with good impulses and high ideals, and so to exercise a beneficial influence upon his modes of thinking, his habits, and his works.

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* *Nineteenth Century*, August, 1882, p. 220.

Thus far, the course of study I have suggested would be common to all pupils of these schools. But beyond this point, in all large schools, particularly in great commercial cities, such as London, Liverpool, Birmingham, and Manchester, the principle of bifurcation might be introduced, with a view of giving to the school a commercial as well as a technical character. Every one knows how difficult it is at present, in spite of the overstocked state of the market, to obtain good clerks, and how frequently it happens that foreign clerks, especially Germans, succeed in commercial houses where our own fail. That this is mainly owing to the want of adequate education, there can be little doubt. Boys who have opportunities of entering commercial houses, or who show a special aptitude for writing, arithmetic, and language, should receive special instruction in these schools in handwriting, book-keeping, shorthand, commercial arithmetic, and French and German correspondence; whilst the pupils on the technical side—those who expect to earn their living by the use of their hands—and in all our great manufacturing centres these would constitute the larger class—should have workshop instruction and lessons in machine drawing. The practical work to be done in the shops attached to these schools should be more exact, and altogether of a higher grade than that done in the elementary schools, where the instruction would be restricted to the mere handling and use of tools. It should give the boy some really valuable constructive skill, and would form a fitting preliminary to his apprenticeship, the term of which might certainly be thereby diminished. This practical instruction would vary very much according to the district in which the school is situated. In our commercial cities and great manufacturing towns, the instruction would be of a general character, consisting largely of wood work and of metal work at the bench, at the lathe, and at the forge. To a boy going afterwards into an engineer's shop, such instruction would doubtless be of considerable utility; but equally in almost every other industry this practical training would enable him to learn, with much greater rapidity, the details of his trade. Many of the most useful improvements in machines have been made by workmen, after a succession of trials and errors. A large manufacturer, who had himself been a working man, told me, very recently, that this had been the case with most of the improvements that had been introduced into the complicated machinery used in lace manufacture; and there can be little doubt that such improvements might be more frequently effected, if select workmen received at school the practical education I have suggested.

It is, however, in the education of foremen that such schools are likely to prove of the greatest benefit. In consequence of the extreme subdivision of labour, which often condemns a man for the greater part of his life to the same task, it is becoming more and more difficult, in certain industries, to select competent foremen from the general body of workmen. We are often told that the foreman, like the poet, *nascitur non fit*; that he is chosen not so much for his superior knowledge or skill as for his innate power of influencing others, for his tact, and other qualities which mark him out for a position of command. But other things being the same, the better-educated workman, who had been trained in such a practical school as I have described, and who, as a boy, had been selected for such training in consequence of his superior intelligence and skill, would have advantages over his fellow-workpeople which would bring him to the front, and render him more capable and efficient than the man who is scarcely in any way superior to those whom he directs.

As I have already stated, the special work that will be done in the shops attached to these schools would depend very much upon the locality of the school. In rural districts, it might be found advisable to substitute practical agriculture for workshop instruction. Where a new industry has to be created, the teaching might be specialised with the view to a particular trade. In manufacturing towns, it might be advantageous to give the pupils, by way of object lessons, some elementary ideas of the technology of the raw product, be it wood, iron, cotton, or wool, the manufacture of which may form the staple industry of the place. In girls' schools the time set apart for work in the shops might be devoted to dressmaking, cooking, china painting, and other occupations. But the consideration of this part of the question would take me far beyond the limits which I have prescribed for myself in this paper.

The last point I have to consider is how this higher education may be best established and maintained, and this leads me to touch upon the practical question of fees. Intermediate schools, such as I have described, ought to be placed within the reach of the better class of artisans, of foremen of works, small manufacturers, and small shopkeepers. The fees ought to be such as persons in what is called the lower middle-class of society could afford to pay. They should not be so high as to place the instruction beyond the reach of such people, nor so low as to give to the education a too distinctly eleemosynary character. Considering the prevailing feeling in this country, that persons able to pay for the education of their children should not avail themselves of the instruction given in the public elementary schools, most of these intermediate schools of which I am speaking might have a junior department attached to them, for the children of parents capable of paying fees in excess of the maximum fee chargeable by the School Board. If intermediate education were under the direction of the State, there would be no difficulty in the establishment of such schools; but as School Boards throughout the country are unable to earn grants, and at the same time to make a higher charge than 9d. a week, a difficulty does present itself. For the education given in these schools would be largely sought after by parents willing and able to pay higher fees, and it would be in opposition to the best interests of the school to exclude this class of children from its benefits. The admixture of the poorer, but in some cases more gifted, children of public elementary schools with other children having a higher standard of living, and occupying a somewhat better position in the social scale, would tend to improve both classes of pupils, and would give a good tone to the school work.

In what way the means may be found for the establishment of these schools without State aid, I am not prepared to say. There still exist endowments originally intended to provide elementary education for poor children, which are no longer needed, and which might be utilised in this direction. Public enterprise, aided by public and private generosity, might step in and help to set such schools afloat, as has been done in the case of the high schools for girls, and more recently in the case of the middle schools for boys. I am not without hopes that the Boys' Day School Company may consider the provision of these technical intermediate schools to come within the sphere of its intended operations. Such schools are certainly more wanted, and I believe they might be made a more profitable investment, than the ordinary Latin school. Again, numbers of existing schools might adapt their curriculum to the requirements of the industrial classes, and help to fill up this great lacuna in our educational system. But if no endowments can be found available, if public enterprise will afford no aid, and if existing schools continue to cling to the traditions of the past, then I think it will become necessary for the School Boards to provide suitable instruction for the selected children of the public elementary schools; and if, as certainly will happen, the children of a somewhat wealthier class avail themselves of this State-aided teaching, it seems to me that it is better, far better, that a few persons who can afford to pay should accept eleemosynary instruction, than that hundreds and thousands of promising children should go without it. But both on moral and on social grounds, and for the assistance that would be thus afforded in the maintenance of these schools, I cannot help thinking that it would be well if the maximum school fees in these higher elementary schools could be raised from 3s. to 6s. or 8s. per month. It may be said that I have grouped together, without distinction, higher elementary and middle-class schools. I have done so because I can see no reason, beyond one resting on very insufficient social grounds, to separate them. Such schools might be made to serve for those who can, and cannot, afford to pay for their own education. The School Board might be empowered to pay part or the whole of the fees of the deserving children drafted by competition into the higher schools; and, in certain cases, the most needy of the children should receive scholarships to help towards their maintenance, and to compensate their parents for the loss of their children's early earnings. The expenses of the maintenance of the schools would be in part defrayed by the grants obtained from the Science and Art Department, and by those of the Education Department on specific subjects; and if the funds at the disposal of the City and Guilds of London Institute were sufficient to enable the Council to give assistance to such schools, it is very possible that they might be willing to pay on the results of the examinations of the manual work done by boys preparing for apprenticeship, much in the same way as they now pay on the results of the examinations of apprentices and workmen in different branches of technology.

From what I have said, it will be seen that I am inclined to agree with those persons who consider that this higher instruction should be given in separate schools, into which the selected pupils of the ordinary elementary schools would be drafted. It must be remembered that the necessary teaching appliances in intermediate schools such as I have described are somewhat costly, but that, when they are adequately provided, they serve for the education of a larger number of children than are likely to be able to avail themselves of such advanced instruction in any one school. Moreover, I think it a waste of national strength to over-educate, at the country's expense, the dullards of a school. There must be hewers of wood and drawers of water to the end of time. What we have to see to is that, whilst we send out into the world, adequately equipped with knowledge, the rank and file of our children, to occupy the lower rungs of the great industrial ladder, we lose no opportunity of selecting the children of special aptitudes and brighter intellects, and of training them for higher posts, so that there may not be lost to the industry and commerce of our country, which so greatly needs their aid, a spark of genius nor a stroke of skill.

III. Of schools giving an education somewhat on the lines I have suggested, there are already a few good examples in Great Britain. Of these, one of the most sucessful, perhaps, and certainly one of the most recent, is the upper department of the Central School at Sheffield. Mr. Cole, Chairman of the Sheffield School Board, in his report, says :—

> "In this higher department, our general aim is not to lift our young people out of their own sphere, but to lay that foundation for the intelligent future pursuit of technical knowledge and skill, which will enable them so to deal with the difficulties of their trade, that they may compete successfully with every similar class of workmen in any part of the world."

This school is situated in a central part of Sheffield, and children are admitted into it, at about 12 years of age, by competitive examination from a few private schools, and from the Fifth Standard of the public elementary schools. Mr. Moss, clerk of the Sheffield School Board, who has devoted much time and thought to the consideration of this subject, informs me that, last year, only 3 per cent. of the children examined by the Government inspectors for England and Wales, were presented in the Sixth Standard, 8 per cent. in the Fifth Standard, and 16 per cent. in the Fourth Standard. It is for the selected children from this small per-centage, numerically large, of the total number of children educated at the public expense, that intermediate technical and commercial schools are needed.

The curriculum of instruction in the Central School, Sheffield, comprises geometry, mathematics, chemistry (theoretical and practical), and physics; freehand, model, geometrical, and machine drawing; handicraft work, consisting of exercises in the production of simple but perfect geometrical forms in iron and wood; and the construction of models, and of simple physical apparatus for use in the school itself. Specimens of the boys' work have been kindly forwarded to me by Mr. Moss, for the inspection of persons who are interested in seeing the kind of work that can be done by school boys devoting to it only a few hours a week.

It is proposed to introduce into the school curriculum modelling, and more advanced art work for the higher education of pupils showing special aptitude in this direction. The workshops have been fitted up by the liberality of the manufacturers of Sheffield; but the school feels the want of some external authority to test the work done by the boys, and to assist

Sheffield Central Schools.—Entrance Examinations.

	Minimum Standard to be passed.	Total No. examined.	No. who passed and were received.	No. who failed.	Of the No. who passed, there came from.	
					Public Elementary Schools.	Private Schools.
1880 ...	4th Stand.	587	305	282	289	16
1881 ...	5th ,,	403	196	207	183	13
1882 ...	5th ,,	335	172	163	165	7
		1,325	673	652	637	36

No. on books during month ending September, 1882 312
Average attendance during same period 284

the Board, by means of grants on examination, in meeting the expenses which this special instruction involves. It appears from the table in the preceding page, taken from the last Report, November, 1882, of the Sheffield School Board, that in the year 1882, 335 candidates were examined for admission into the Central School; that of these, 172 were admitted, and that of this number, 165 were candidates who had passed the Fifth Standard of the public elementary schools, whilst seven came from the private schools of the town.

Another school, of a somewhat higher grade, giving workshop instruction, is the Allan Glen's Institution in the City of Glasgow. This school owes much to the energy and high organising powers of its head master, Mr. E. M. Dixon, who himself has visited some of the principal technical schools of Europe. The school contains an elementary, a secondary, and a technical department. In the secondary department the instruction consists largely of mathematics, drawing, and science, and it serves as a preparation for the higher school. The technical department has a two years' course, in the first of which the studies are common to all the pupils, whilst in the second, they are specialised, according as the pupil intends to devote himself to engineering or to chemistry. Those who stay long enough pass three years in the school workshops. In the first year, they have two and a half hours' workshop instruction per week, in the second three hours, and in the third year five hours.

The fees vary from £3 to £6 a year in the secondary school, while they are as much as £8 8s. per year for the complete course in the technical department. Nearly all the pupils of the technical department of this school come from the public elementary schools of Glasgow, which, throughout Scotland, are frequented by rich and poor alike to a much greater extent than is the case in South Britain. I am informed that the practical skill gained by these pupils, devoting during three years not more than half-a-day per week to workshop instruction, is fully equivalent to that which they would acquire in the first two years of their apprenticeship to an engineer. The models here exhibited of the work done in this school are in nearly all cases made from working drawings prepared by the pupils themselves.

There are a few schools in other parts of the kingdom, notably in Keighley, Nottingham, and Manchester, which approach more or less nearly to the type of school to which reference has been made in this paper.

Abroad, the best specimens of intermediate schools, combining technical and secondary education, are those in France. By a law recently passed, the education in the higher elementary schools, the curriculum of which includes classes of professional instruction, have been made free, and these schools rank as public primary schools.

By reference to the First Report of the Commissioners on Technical Instruction, it will be seen that—

> "Besides the ordinary elementary schools, there are, in most of the large towns, superior elementary schools (*écoles primaires complementaires*) for literary, and, in some cases, technical instruction. The cost of instruction in these schools, when it is not free to all, is very cheap, from 7 francs to 10 francs per month, and even these low fees are, in the case of the non-gratuitous schools, either partially or wholly remitted to many pupils by means of scholarships (*bourses*) granted by the State, the departments, and the communes. The entrance is obtained by a non-competitive qualifying examination, or on presentation of the *certificat d'études primaires*, to which we allude later. Some of these schools provide workshop instruction adapted to the wants of the industries of the districts in which they are situated. We have not been able to obtain recent statistics of these schools, but they are increasing rapidly in number, though they are still confined to the larger towns."

According to a notice that appeared recently in the *Times*,* these schools have increased, since 1879, from 20 to 400.

Of such schools, one of the oldest and one of the best is the Ecole La Martinière, at Lyons. This school is situated in the centre of a great weaving and dyeing district, and the courses of instruction, besides including wood and iron work, modelling, mechanics, physics and chemistry, are specialised in the second and third years, to give the pupils an opportunity of knowing something about chemistry in its application to dyeing, the mechanism of the loom, and the theory of weaving. A description of this school, and of many other similar institutions, including the Ecole Turgot of Paris, the Ecole Primaire Complémentaire at Rheims, one of the most recent and best of the higher elementary schools of France, and the Ecole Professionelle of Rouen, will be found in the second report of the Commissioners, which it is hoped will be issued during the present year.

In their preliminary report, from which I have already quoted, frequent reference is made

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to the higher elementary schools of France, of which little appears to be yet known in this country. On page 25 will be found a notice of a report of M. Tolain, president of a commission appointed by the Minister of Public Instruction, in which he recommends the establishment of "a series of graded schools consisting of a *salle d'asile* and Kinder-garten; an ordinary primary school, in which manual work is taught; and a superior primary school of a somewhat advanced character, including technical instruction, and extended over a three years' course."

In Italy, Germany, and elsewhere, similar schools are found, in which preliminary instruction is continued, and connected more or less with specialised practical work. But I must not anticipate the contents of the Commissioners' second Report. Even now, I must ask you to accept the suggestions I have made as my own, and not necessarily those of my colleagues on the Commission. Indeed, I felt some hesitation in responding to the invitation of your Secretary, to read a paper on a subject which really forms a part of the investigations entrusted to the Commissioners; but, knowing how prominently this question has been brought under public notice, and how important it is that this great want in our educational system should be speedily supplied, I have assumed the responsibility of giving my own conclusions, as fetched from the experience I have acquired of the working of foreign schools, and of the want of similar institutions at home.

One word more. A short time since, when speaking at the opening of the Finsbury Technical College, I remarked that the wave that is now pushing forward technical education would not subside until schools of every grade had felt its influence. Judging from a notice in the report issued by the Commissioners of Education in the United States, the new impulse seems to have affected the schools of America in much the same way as I expect it will before long influence our own. The report states:—

> "The multiplication and growth of schools of science has been a marked feature in the recent history of education in America. Either the stimulus given to them by the national aid, or the sentiment which compelled Congress to give help to higher education, has carried forward and deepened the interest in industrial, scientific, and technical instruction. Students are now more frequently choosing lines of study which lead to a life of business, activity, or to prominent positions in industrial pursuits. Colleges that a few years since held strictly to a rigid classical course are feeling the new impulse, and are striving to add to their efficiency, by making provision for special instruction preparatory to definite occupations. Men of wealth are endowing schools of science and technology more richly than other institutions; for they believe that the practical education which has now come to the front will do more than anything else to promote the industry and prosperity of individuals, and to utilise the resources of nations." *

If men of wealth in every town in England would lend a helping hand to the establishment of intermediate or second grade technical schools, to supply the missing link between our primary schools and the technical colleges or trade schools, many of which are now being erected in different parts of the kingdom, the difficulties to which I have referred would be quickly removed, and England might have reason to be proud of possessing as complete and well-organised a system of technical education as can be found in any country in the world.

DISCUSSION.

Mr. Moss, clerk to the School Board for Sheffield, said it was gratifying to hear from the lips of one of the Royal Commissioners of the advance which had been made in liberality of opinion on the subject of technical education. The experiment which had been made in Sheffield was somewhat novel, but they had every reason to be gratified with the success which had attended it. It was modest in its dimensions, but definite in its aims, and it could not vie in importance with the Allan Glen Institute, at Glasgow. He almost envied the work of Mr. Dixon in his school, and the meeting would, no doubt, hear a great deal from him with regard to the application of technical knowledge to the special industries to which attention had been given in that school. During ten years, he had spent considerable time in visiting Continental schools, and he had found that whereas in Germany and Austria technical education was given to pupils who could stay at schools until they were seventeen or eighteen, no attempt was made to bring it within the reach of the artisan classes. The École Turgot, at Paris, appeared to be the best example of such a school for English teachers to follow, for the benefit especially of the artisan classes. There were there children drawn from the public elementary schools of Paris, and he had been surprised at the work he saw done. He thought it was within the province of the constituted educational authorities to do that kind of work in the great towns in England. In Sheffield, they had only attempted to give workshop instruction to the higher classes in their central school, but they had found it very difficult to crowd more subjects into the curriculum forced upon them by the School Board. Boys there learned something of practical geometry, and began to make in the workshop correct geometrical forms, and the specimens before the meeting, produced by boys of twelve to fourteen, were the result of instruction given in the geometrical drawing class in connection with the use of tools. He hoped the pupils so taught would be able to go forth to such institutions as the Allen Glen College in Glasgow, and continue their instruction there to a much more advanced stage. The Sheffield Central School had succeeded in obtaining from the City Guilds Institute a grant for the establishment of a school for engineers, and the pupils who could take advantage of the scheme would get the benefit of as grand an educational system as any town could boast of. With regard to a remark that the instruction was not required to be special he had had to conduct, some weeks ago, a number of working men connected with trade associations, and, after going through the workshop and chemical laboratory, they all expressed a very strong opinion that whatever might be the trade or employment to which a boy might afterwards be put, he would there get a most valuable preparation for it, and they wished that it could be placed within the reach of every working man's child. Although the teaching might not bear directly on the trade to which a boy might afterwards be put, it would have a most important bearing on his career. It was exceedingly important that whatever trade a boy was intended to pursue, he should have some knowledge of the use of tools imparted to him, and the power of putting on paper ideas which others might be enabled to carry out and improve upon.

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* Extracted from notice of report in *Nature*, May 10th, 1883.

Mr. E. M. **Dixon** would confine his remarks to the school at Glasgow, which he represented. That school had been divided into three departments—elementary, secondary, and purely technical. By elementary, they meant the education a lad usually received until he had passed the Fifth Standard of the common Board school. The first class in the secondary department corresponded roughly with the Sixth Standard, but went considerably beyond it in mathematics and drawing. In that class no very earnest effort was made to teach science proper, though a little experimental science, as far as principles went, was taught, with the view of preparing for the following classes. They carried the boys' education four years beyond what the common Board school did, and in the first year of the extra period they commenced in earnest the teaching of science. Then followed chemistry, physics, solid geometry, and hitherto physiology; but he was afraid that the study of physiology would have to be discontinued, and that they would have to confine themselves more to subjects bearing upon chemical and engineering matters. Up to this time, the teaching of English had been going on side by side with these scientific studies. In the highest class of the secondary department, the boys were introduced to the laboratory and the workshop. The object in this was not so much to train the scholars in manual dexterity as to make their studies more real to them. Though dexterity was of course acquired, the important point was to make their instruction in technical drawing and applied mechanics more a real to them. In the purely technical department they dropped the study of English altogether, and merely carried on, in the way of languages, the study of French and German. They had been anxious to carry out the ideas of the Science and Art Department in the third year, but as they dealt with somewhat different subjects, a difficulty had arisen. He had taken the opinions of experienced engineers and chemists as to whether it was advisable that the young engineer should drop his studies in chemistry, and the future chemist his mechanics, and the unanimous opinion given was that the pupils' studies should be carried further than what the Science and Art Department called the elementary stage. Accordingly, the boys were all allowed to go on with their engineering and chemical studies until the last year, when they had to take a side, some pursuing chemical, and others mechanical studies, in the workshop and laboratory. It was intended to add metallurgy to the chemistry, a very important branch of science in which chemists were finding employment. Those remarks would convey a general idea of the method of teaching adopted in the school; and to show the results from it, he had sent up for examination by those present specimens of the work done by the boys in wood and metal, and a number of their drawings from models. Some of these were evidently the work of mere beginners, while others were of very superior execution. The lads of course started with no manual dexterity whatever, but they went on working in the shop for three years. In the first year they were only there two-and-a-half hours in the week, and to avoid their cutting up the wood, they were supplied with uselessly, they were charged for it, and allowed to take home the simple articles they were able to make, such as the knife-boxes, writing-desks, and tool-chests exhibited. After the first year, they were able to make models which were of use in the school, drawing them first on paper, and then working to scale from the drawings. One set of drawings in the room had been made from the lathe used in the workshop. The result was that the boys became well acquainted with mechanical drawing. The school was only in its fifth year, but the boys who had passed completely through the course of teaching had proved their superiority over other lads who had been working at their trades for a considerable time. Notwithstanding, he thought it inadvisable to shorten the period of apprenticeship, as it took a long time to make a thoroughly skilled engineer, and five years was not too much, even with the teaching afforded in the school.

Mr. E. C. Robins, a member of the Council of the City Institute, said Mr. Magnus had presented an excellent *résumé* of the whole subject, from the infant school to the University, in connexion with technical education, the true meaning of which was to teach more about things themselves than could be conveyed by mere language; words represented the thought in their minds, but the things which the words represented were more important, not only for artisans to understand, but for the professional men who designed for them. The knowledge of principles gained in the workshop went far beyond mere book learning, and he hoped the system referred to by Mr. Magnus would be largely carried out, and the sooner they could get it introduced by the School Board into elementary education, the better for them all.

Mr. D. Walker, Practical Instructor in the Technical Classes at King's College, said the time and attention which Mr. Magnus had given to these subjects was well known. For 15 years he had himself been foreman in large factories, and had numbers of apprentices in his charge. He found that the general education of the youths had a great influence on their success in learning their trade. For the last ten years he had been training men in the higher classes of mechanical work, and had found good results from the teaching. Hardly any comparison could be made between those who learned in that way and the ordinary workmen in manipulative skill, as the former were far in advance of the others. Mr. Magnus had sketched out a curriculum which had been advocated by many professors. In Leeds, where students entered works to pass through the ordinary articled pupils' career, their time had in this way been, in some cases, reduced. He did not agree with beginning work of this kind too early, and he thought there was not much gained by boys commencing it before they were 13 years old. There was a possibility of going too far in that direction, looking at their experience from the Continent.

The Rev. Mr. Pearson, member of the School Board for Hackney, said they had many practical evidences of the interest which this subject was beginning to excite among the public. Scholars should be taught to use their hands with dexterity, and the system of giving object lessons should be further extended. He had brought the subject forward at the School Board, though unsuccessfully, but he was glad to say Dr. Gladstone had taken it up, and a committee had been appointed to consider it. He hoped they would have the assistance of Mr. Magnus, Professor Silvanus Thompson, Mr. H. Trueman Wood, and other gentlemen like them, who would help in this excellent work. Such knowledge, if given to men—and particularly to women—would vastly increase their happiness. He regretted that no lady members of the School Board were present, as they would no doubt have supplied the omission, so far as the discussion of the subject, that the technical education of women had not been dealt with.

The Chairman referred to the importance of the subject to the industrial activity of England, as well as to the literary and professional classes who would be benefited by it. He could not help feeling, however, that there was great difficulty in introducing much technical teaching in the way of handicrafts into our schools as they were at present organised. The time at teachers' disposal was so limited, and the curriculum of subjects under the Code so extensive, that it would be difficult to find an opportunity to teach what might be called handicraft. In France, though the hours of study were longer, handicraft instruction had to be given to the boys before the ordinary school studies commenced, and after they were over; and it seemed impossible, therefore, that it could be given in England without a very material extension of school hours. But he heartily agreed with Mr. Magnus in the necessity for model drawing being made the ground work for technical instruction in schools. Another subject greatly required was mathematics, which should be taught instead of physiology and other subjects which teachers were so fond of taking. They were rendered almost useless in consequence of actual demonstration being prohibited by the Code—a model might be used, but a sheep's eye or bullock's heart could not be brought for dissection, to show what the things taught really were. Teachers should be instructed to teach mathematics, both geometry and algebra. Some people would have technical schools mainly schools of science, and others advocated the exclusive teaching of manual dexterity. He was not competent to say which was the better method, but his inclination was rather to side with Mr. Dixon in saying that, up to the age of 16, the object should rather be to give the boys a groundwork of practical knowledge. At Oldham, where the science school had been mainly founded and supported by Messrs. Platt Brothers, who took a great interest in the industrial education of the people, Mr. Platt had told him they would rather their apprentices came to them without any practical knowledge, so that they might learn from the beginning, without having to correct wrong ideas which they might have got from a somewhat smattering kind of teaching. Some fifteen or twenty years ago, at the works in the north of England, German chemists were usually found, but now the gradual growth of scientific teaching in England had resulted in English chemists being more generally employed. No doubt great progress had been made in the last few years in practical scientific teaching. Of course the School Board should endeavour to carry out these objects, but they were not so free to do what they desired as people supposed, and they did not yet dare to build in London proper drawing class-rooms, where the pupils could be taught to draw from models. In all London they had not been able to establish one laboratory where the boys, or even the teachers, could receive practical instruction in chemistry. Those places were required, and ought to be provided, but the London ratepayers would not furnish the means.

Mr. MOSS desired to add that it had not been found possible in their school to give the technical instruction required within the ordinary school hours, but the boys willingly came earlier to receive it.

Mr. MAGNUS said he had not entered specially into the subject of primary education, as he more particularly wanted to see the "missing link" established in our system of education, into which pupils from the primary schools could be drafted. The subject of technical instruction to women was too large a one to be dealt with satisfactorily as a mere section of his paper. Abroad, schools existed where such instruction was given to girls combined with the ordinary education. It was at that hour too late to enter upon the vexed question of the opinions of manufacturers, as to the value of handicraft teaching in schools which boys might bring into their workshops; but he hoped that the results of the experiments which had been made would lead all to the same conclusion on the subject as he had arrived at in his paper.

The CHAIRMAN added that the only technical instruction, strictly speaking, which the London School Board was giving to women, was in the art of cookery.

The meeting concluded with votes of thanks to the author of the paper.